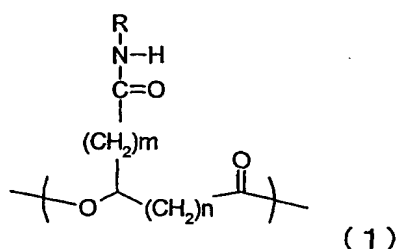


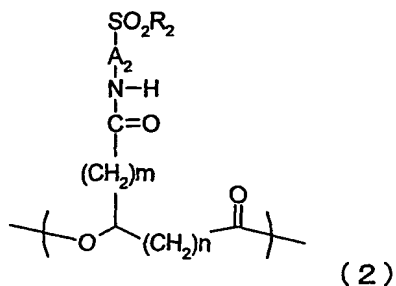
CLAIMS

1. Polyhydroxyalkanoate comprised of at least a unit represented by a chemical formula (1) within the molecule:

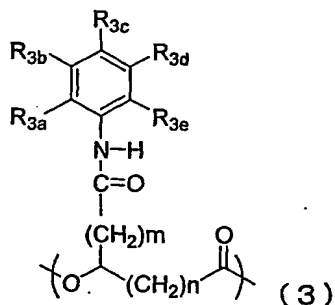


wherein R represents $-\text{A}_1-\text{SO}_2\text{R}_1$; R_1 represents OH, a halogen atom, ONa, OK or OR_{1a} ; R_{1a} and A_1 each independently represents a group having a substituted or unsubstituted aliphatic hydrocarbon structure, a substituted or unsubstituted aromatic ring structure or a substituted or unsubstituted heterocyclic structure; n represents an integer selected from 0 to 4; m represents an integer selected from 0 - 8 in case n is 0, 2, 3 or 4, and m represents 0 in case n is 1; and in case plural units are present, R, R_1 , R_{1a} , A_1 , m and n have the aforementioned meanings independently for each unit.

2. Polyhydroxyalkanoate according to claim 1, comprised of, as the unit represented by the chemical formula (1), at least a unit represented by a chemical formula (2), a chemical formula (3), a chemical formula (4A) or (4B), within the molecule:

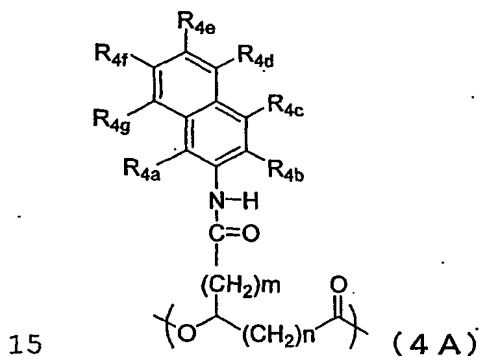


- wherein R_2 represents OH, a halogen atom, ONa, OK or OR_{2a} ; R_{2a} represents a linear or branched alkyl group with 1 to 8 carbon atoms or a substituted or
- 5 unsubstituted phenyl group, A_2 represents a linear or branched alkylene group with 1 to 8 carbon atoms; n represents an integer selected from 0 to 4; m represents an integer selected from 0 - 8 in case n is 0, 2, 3 or 4, and m represents 0 in case n is 1;
- 10 and in case plural units are present, A_2 , R_2 , R_{2a} , m and n have the aforementioned meanings independently for each unit;



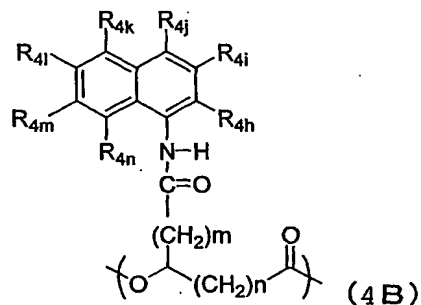
- wherein R_{3a} , R_{3b} , R_{3c} , R_{3d} and R_{3e} each independently
- 15 represents SO_2R_{3f} (R_{3f} representing OH, a halogen atom, ONa, OK or OR_{3f1} (R_{3f1} representing a linear or branched alkyl group with 1 to 8 carbon atoms or a substituted

or unsubstituted phenyl group)), a hydrogen atom, a halogen atom, an alkyl group with 1 - 20 carbon atoms, an alkoxy group with 1 - 20 carbon atoms, an OH group, an NH₂ group, an NO₂ group, COOR_{3g} (R_{3g} representing a H atom, a Na atom or a K atom), an acetamide group, an OPh group, a NPh group, a CF₃ group, a C₂F₅ group or a C₃F₇ group (Ph indicating a phenyl group), of which at least one is SO₂R_{3f}; n represents an integer selected from 0 to 4; m represents an integer selected from 0 - 8 in case n is 0, 2, 3 or 4, and m represents 0 in case n is 1; and in case plural units are present, R_{3a}, R_{3b}, R_{3c}, R_{3d}, R_{3e}, R_{3f}, R_{3f1}, R_{3g}, m and n have the aforementioned meanings independently for each unit;



wherein R_{4a}, R_{4b}, R_{4c}, R_{4d}, R_{4e}, R_{4f} and R_{4g} each independently represents SO₂R_{4o} (R_{4o} representing OH, a halogen atom, ONa, OK or OR_{4o1} (R_{4o1} representing a linear or branched alkyl group with 1 to 8 carbon atoms or a substituted or unsubstituted phenyl group)), a hydrogen atom, a halogen atom, an alkyl

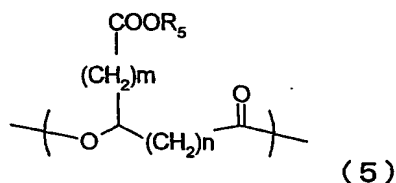
group with 1 - 20 carbon atoms, an alkoxy group with 1 - 20 carbon atoms, an OH group, an NH₂ group, an NO₂ group, COOR_{4p} (R_{4p} representing a H atom, a Na atom or a K atom), an acetamide group, an OPh group, an NHPh group, a CF₃ group, a C₂F₅ group or a C₃F₇ group (Ph indicating a phenyl group), of which at least one is SO₂R_{4o}; n represents an integer selected from 0 to 4; m represents an integer selected from 0 - 8 in case n is 0, 2, 3 or 4, and m represents 0 in case n is 1; and in case plural units are present, R_{4a}, R_{4b}, R_{4c}, R_{4d}, R_{4e}, R_{4f}, R_{4g}, R_{4o}, R_{4o1}, R_{4p}, m and n have the aforementioned meanings independently for each unit;



wherein R_{4h}, R_{4i}, R_{4j}, R_{4k}, R_{4l}, R_{4m} and R_{4n} each independently represents SO₂R_{4o} (R_{4o} representing OH, a halogen atom, ONa, OK or OR_{4o1} (R_{4o1} representing a linear or branched alkyl group with 1 to 8 carbon atoms or a substituted or unsubstituted phenyl group)), a hydrogen atom, a halogen atom, an alkyl group with 1 - 20 carbon atoms, an alkoxy group with 1 - 20 carbon atoms, an OH group, an NH₂ group, an NO₂ group, COOR_{4p} (R_{4p} representing a H atom, a Na atom or

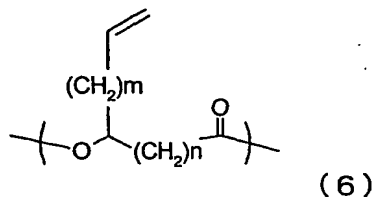
a K atom), an acetamide group, an OPh group, an NHPh group, a CF₃ group, a C₂F₅ group or a C₃F₇ group (Ph indicating a phenyl group), of which at least one is Sφ₂R_{4o}; n represents an integer selected from 0 to 4;
 5 m represents an integer selected from 0 - 8 in case n is 0, 2, 3 or 4, and m represents 0 in case n is 1; and in case plural units are present, R_{4h}, R_{4i}, R_{4j}, R_{4k}, R_{4l}, R_{4m}, R_{4n}, R_{4o}, R_{4ol}, R_{4p}, m and n have the
 10 aforementioned meanings independently for each unit.

3. Polyhydroxyalkanoate comprised of at least a unit represented by a chemical formula (5) within the molecule:



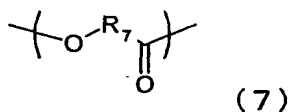
wherein R₅ represents hydrogen, a group capable of
 15 forming a salt or R_{5a}; R_{5a} represents a linear or branched alkyl group with 1 - 12 carbon atoms, an aralkyl group or a substituent having a sugar; n represents an integer selected from 0, 2, 3, 4; m represents an integer selected from 2 - 8 in case n
 20 is 0, wherein R₅ represents R_{5a} only in case m is 2, and m represents an integer selected from 0 - 8 in case n is an integer selected from 2 - 4; and in case plural units are present, R₅, R_{5a}, m and n have the
 aforementioned meanings independently for each unit.

4. Polyhydroxyalkanoate comprised of at least a unit represented by a chemical formula (6) within the molecule:



5 wherein n represents an integer selected from 0, 2, 3, 4; m represents an integer selected from 2 - 8 in case n is 0; m represents an integer selected from 0 - 8 in case n is 2 or 3, and m represents an integer selected from 0 and 2 - 8 in case n is 4; and in case plural units are present, m and n have the aforementioned meanings independently for each unit.

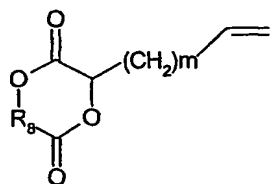
5. Polyhydroxyalkanoate according to any one of claims 1 to 4, further comprising a unit represented by a chemical formula (7) within the molecule:



wherein R₇ represents a linear or branched alkylene with 1 - 11 carbon atoms, alkyleneoxyalkylene group (each alkylene group being independently with 1 - 2 carbon atoms), a linear or branched alkenyl group with 1 - 11 carbon atoms or an alkylidene group with 1 - 5 carbon atoms which is unsubstituted or substituted with an aryl group; and in case plural

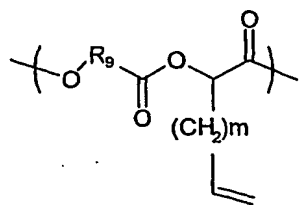
units are present, R_7 has the aforementioned meanings independently for each unit.

6. A method for producing polyhydroxyalkanoate represented by a chemical formula (9), comprised of a
 5 step of polymerizing a compound represented by a chemical formula (8) in the presence of a catalyst:



(8)

wherein R_8 represents a linear or branched alkylene with 1 - 11 carbon atoms, alkyleneoxyalkylene group
 10 (each alkylene group being independently with 1 - 2 carbon atoms), a linear or branched alkenyl group with 1 - 11 carbon atoms or an alkylidene group with 1 - 5 carbon atoms which is unsubstituted or substituted with an aryl group; and m represents an
 15 integer selected from 2 - 8;

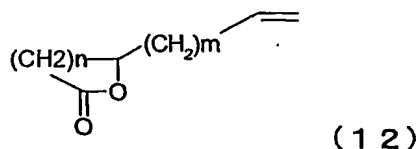


(9)

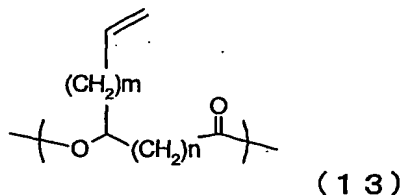
wherein R_9 represents a linear or branched alkylene or alkyleneoxyalkylene group with 1 - 11 carbon atoms
 (each alkylene group being independently with 1 - 2
 20 carbon atoms), a linear or branched alkenyl group

with 1 - 11 carbon atoms or an alkylidene group with
 1 - 5 carbon atoms which is unsubstituted or
 substituted with an aryl group; m represents an
 integer selected from 2 - 8; and in case plural units
 5 are present, R₃ and m have the aforementioned
 meanings independently for each unit.

7. A method for producing polyhydroxyalkanoate
 represented by a chemical formula (13), comprised of
 a step of polymerizing a compound represented by a
 10 chemical formula (12) in the presence of a catalyst:

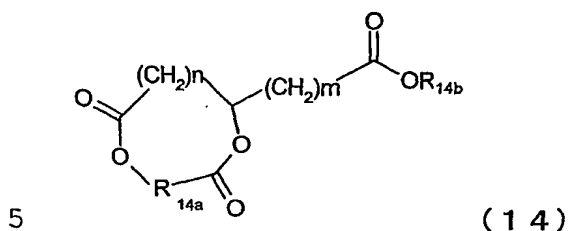


wherein n represents an integer selected from 2 to 4;
 m represents an integer selected from 0 - 8 in case n
 is 2 or 3, and m represents an integer selected from
 15 0 and 2 - 8 in case n is 4:

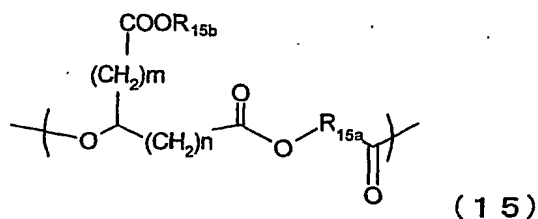


wherein n represents an integer selected from 2 to 4;
 m represents an integer selected from 0 - 8 in case n
 is 2 or 3, and m represents an integer selected from
 20 0 and 2 - 8 in case n is 4, and in case plural units
 are present, m and n have the aforementioned meanings
 independently for each unit.

8. A method for producing polyhydroxyalkanoate represented by a chemical formula (15), comprised of a step of polymerizing a compound represented by a chemical formula (14) in the presence of a catalyst:



wherein R_{14a} represents a linear or branched alkylene with 1 - 11 carbon atoms, alkyleneoxyalkylene group (each alkylene group being independently with 1 - 2 carbon atoms), a linear or branched alkenyl group with 1 - 11 carbon atoms or an alkylidene group with 1 - 5 carbon atoms which is unsubstituted or substituted with an aryl group; R_{14b} represents a linear or branched alkyl group with 1 - 12 carbon atoms or an aralkyl group; n represents an integer selected from 0, 2, 3 and 4; m represents an integer selected from 2 - 8 in case n is 0 and an integer selected from 0 - 8 in case n is selected from 2 - 4;

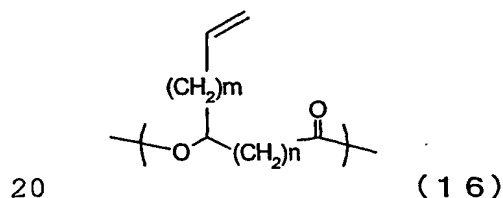


wherein R_{15a} represents a linear or branched alkylene with 1 - 11 carbon atoms, alkyleneoxyalkylene group

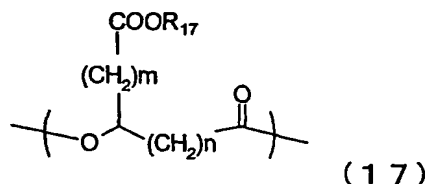
20

(each alkylene group being independently with 1 - 2 carbon atoms), a linear or branched alkenyl group with 1 - 11 carbon atoms or an alkylidene group with 1 - 5 carbon atoms which is unsubstituted or substituted with an aryl group; R_{15b} represents a linear or branched alkyl with 1 - 12 carbon atoms or an aralkyl group; n represents an integer selected from 0, 2, 3 and 4; m represents an integer selected from 2 - 8 in case n is 0 and an integer selected from 0 - 8 in case n is selected from 2 - 4; and in case plural units are present, R_{15a} , R_{15b} , m and n have the aforementioned meanings independently for each unit.

9. A method for producing a polyhydroxyalkanoate comprising a unit represented by a chemical formula (17), comprised of a step of oxidizing a double bond portion of a polyhydroxyalkanoate comprising a unit represented by a chemical formula (16):



wherein m represents an integer selected from 0 - 8; n represents 0, 2, 3 or 4; and, in case plural units are present, m and n have the aforementioned meanings independently for each unit:



wherein m represents an integer selected from 0 - 8;

R₁₇ represents hydrogen, or a group capable of forming a salt; n represents 0, 2, 3 or 4; and, in case

5 plural units are present, m, n and R₁₇ have the aforementioned meanings independently for each unit.

10. A method for producing a

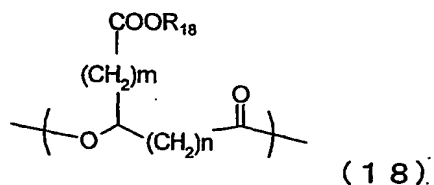
polyhydroxyalkanoate comprising a unit represented by a chemical formula (19), comprised of a step of

10 executing hydrolysis of a polyhydroxyalkanoate

comprising a unit represented by a chemical formula (18) in the presence of an acid or an alkali, or a

step of executing hydrogenolysis comprising a catalytic reduction of a polyhydroxyalkanoate

15 comprising a unit represented by a chemical formula (18):



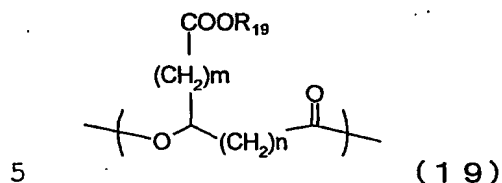
wherein R₁₈ represents a linear or branched alkyl

group with 1 - 12 carbon atoms or an aralkyl group; n

20 represents an integer selected from 0, 2, 3 and 4; m

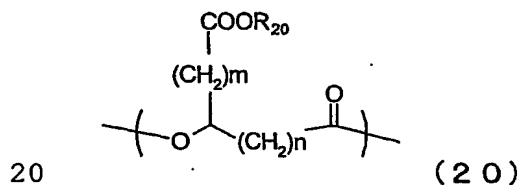
represents an integer selected from 2 - 8 in case n

is 0, or an integer selected from 0 - 8 in case n is 2, 3 or 4; and in case plural units are present, R_{18} , m and n have the aforementioned meanings independently for each unit;



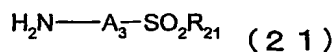
wherein R_{19} represents hydrogen, or a group capable of forming a salt; n represents an integer selected from 0, 2, 3 and 4; m represents an integer selected from 2 - 8 in case n is 0, or an integer selected from 0 - 8 in case n is 2, 3 or 4; and, in case plural units are present, R_{19} , m and n have the aforementioned meanings independently for each unit.

11. A method for producing a polyhydroxyalkanoate comprising a unit represented by a chemical formula (1), comprised of a step of executing a condensation reaction of a polyhydroxyalkanoate comprising a unit represented by a chemical formula (20) and an amine compound represented by a chemical formula (21):

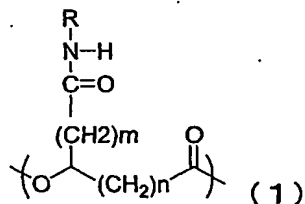


wherein R_{20} represents hydrogen, or a group capable of

forming a salt; n represents an integer selected from 0 - 4; m represents an integer selected from 0 - 8 in case n is 0, 2, 3 or 4, or m is 0 in case n is 1; and, in case plural units are present, m and n and R₂₀ have the aforementioned meanings independently for each unit;



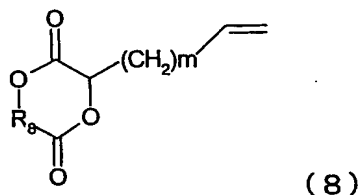
wherein R₂₁ represents OH, a halogen atom, ONa, OK or OR_{21a}; R_{21a} and A₃ each independently is selected from a group having a substituted or unsubstituted aliphatic hydrocarbon structure, a substituted or unsubstituted aromatic ring structure, or a substituted or unsubstituted heterocyclic structure; and, in case plural units are present, R₂₁, R_{21a} and A₃ have the aforementioned meanings independently for each unit;



wherein R represents -A₁-SO₂R₁; R₁ represents OH, a halogen atom, ONa, OK or OR_{1a}; R_{1a} and A₁ each independently represents a group having a substituted or unsubstituted aliphatic hydrocarbon structure, a substituted or unsubstituted aromatic ring structure, or a substituted or unsubstituted heterocyclic structure; n represents an integer selected from 0 to 4; m represents an integer selected from 0 - 8 in

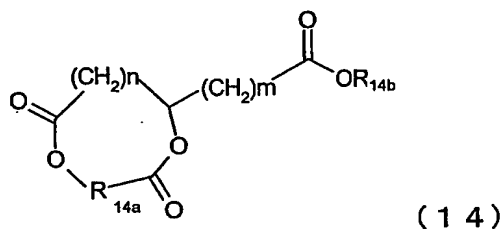
case n is 0, 2, 3 or 4, and m represents 0 in case n is 1; and in case plural units are present, R, R₁, R_{1a}, A₁, m and n have the aforementioned meanings independently for each unit.

- 5 12. A compound represented by a chemical formula (8):



wherein R₈ represents a linear or branched alkylene 1 - 11 carbon atoms, or alkyleneoxyalkylene group with (each alkylene group being independently with 1 - 2 carbon atoms), a linear or branched alkenyl group with 1 - 11 carbon atoms or an alkylidene group with 1 - 5 carbon atoms which is unsubstituted or substituted with an aryl group; and m represents an integer selected from 2 - 8.

13. A compound represented by a chemical formula (14):



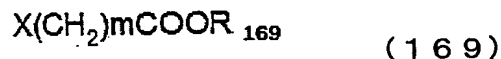
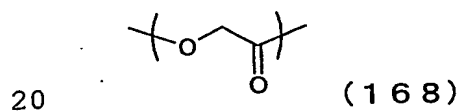
wherein R_{14a} represents a linear or branched alkylene with 1 - 11 carbon atoms, alkyleneoxyalkylene group

(each alkylene group being independently with 1 - 2 carbon atoms), a linear or branched alkenyl group with 1 - 11 carbon atoms or an alkylidene group with 1 - 5 carbon atoms which is unsubstituted or substituted with an aryl group; R_{14b} represents a linear or branched alkyl group with 1 - 12 carbon atoms or an aralkyl group; n represents an integer selected from 0, 2, 3 and 4; m represents an integer selected from 2 - 8 in case n is 0 and an integer selected from 0 - 8 in case n is selected from 2 - 4.

14. A method for producing a polyhydroxyalkanoate comprising a unit represented by a chemical formula (170), comprised of:

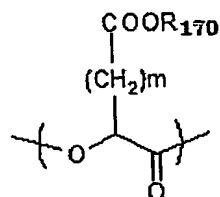
a step of reacting a polyhydroxyalkanoate comprising a unit represented by a chemical formula (168) with a base; and

a step of reacting a compound obtained in the aforementioned step with a compound represented by a chemical formula (169):



wherein m represents an integer selected from 0 - 8; X represents a halogen atom; and R_{169} represents a linear or branched alkyl group with 1 - 12 carbon

atoms or an aralkyl group:



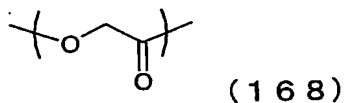
(170)

wherein m represents an integer selected from 0 - 8;
 R₁₇₀ represents a linear or branched alkyl group with
 5 1 - 12 carbon atoms or an aralkyl group; and in case
 plural units are present, R₁₇₀ and m have the
 aforementioned meanings independently for each unit.

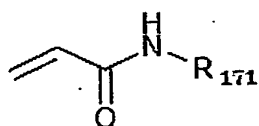
15. A method for producing a
 polyhydroxyalkanoate comprising a unit represented by
 10 a chemical formula (172), comprised of:

a step of reacting a polyhydroxyalkanoate
 comprising a unit represented by a chemical formula
 (168) with a base; and

a step of reacting a compound obtained in the
 15 aforementioned step with a compound represented by a
 chemical formula (171):

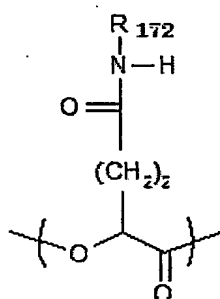


(168)



(171)

wherein R_{171} represents $-A_{171}-SO_2R_{171a}$; R_{171a} represents
 OH, a halogen atom, ONa, OK or OR_{171b} ; R_{171b} and A_{171}
 each independently is selected from a group having a
 substituted or unsubstituted aliphatic hydrocarbon
 5 structure, a substituted or unsubstituted aromatic
 ring structure, or a substituted or unsubstituted
 heterocyclic structure; and in case plural units are
 present, R_{171} , R_{171a} , R_{171b} , and A_{171} have the
 aforementioned meanings independently for each unit;



10

(172)

wherein R_{172} represents $-A_{172}-SO_2R_{172a}$; R_{172a} represents
 OH, a halogen atom, ONa, OK or OR_{172b} ; R_{172b} and A_{172}
 each independently represents a group having a
 substituted or unsubstituted aliphatic hydrocarbon
 15 structure, a substituted or unsubstituted aromatic
 ring structure, or a substituted or unsubstituted
 heterocyclic structure; and in case plural units are
 present, R_{172} , R_{172a} , R_{172b} , and A_{172} have the
 aforementioned meanings independently for each unit.